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(54) Title: MULTIPLE-LAYERED PATCHES FOR TEETH WHITENING

(57) Abstract: The present invention relates to a dry type patch for teeth whitening with multiple-layered structure of three or more layers. More particularly, in the dry type patch, a contact adhesive layer contains no peroxide and comprises a hydrophilic glass polymer as a base polymer so that it may have substantial adhesive strength when hydrated by water, an active material reservoir layer comprises peroxide as a teeth whitening agent, and a backing layer is impermeable to water. The dry type patch of the present invention has a superior teeth whitening effect and an excellent stability of peroxide in the patch at a high temperature since the peroxide-containing layer is covered with and protected by other layers.



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MULTIPLE-LAYERED PATCHES FOR TEETH WHITENING

Technical Field

The present invention relates to a dry type patch that removes stains of teeth
5 and whitens teeth only through attachment to the teeth. More particularly, it relates
to a dry type patch comprising a peroxide, known as an excellent teeth whitening
agent, which is capable of remaining in the attached site for a desired period of time,
thereby achieving a teeth whitening effect in a short period of time. In particular,
the dry type patch of the present invention consists of multi-layer structure having
10 three or more layers, which has excellent adhesive strength and peel-off property,
and is thereby being convenient to use. Further, it has good stability at a high
temperature and good ability to maintain shape during storage, which makes it
comfortable to carry. In addition, due to the dry nature of the patch, the peroxide-
containing layer does not stick to the user's hands or face during the process of its
15 attachment to the teeth. Further, since the patch comprises three or more layers, the
peroxide-containing layer is covered with and protected by other layers, which
improves its safety to human tissue.

Background Art

20 As people's interest in whitening their teeth increases, a number of
toothpastes having teeth whitening effect have become commercially available.
However, even though the toothpaste contains a teeth whitening agent having good
performance, it is hard to achieve significant whitening effect in a short period of
time by brushing teeth with only 1 to 3 minutes of contact time between teeth and
25 toothpaste.

Recently, in order to solve the above problems, a number of patent
applications related thereto have been filed and teeth whitening products of various
formulations have appeared on the market.

For example, in the case of professional whitening gel, a dentist manufactures an individualized mouth tray, which precisely fits the teeth of the patient. The patient applies the whitening gel in a prescribed amount to inner walls and trough of the tray following instructions at home. Therefore, this whitening method has disadvantages in terms of convenience and cost. Furthermore, this method may present problems with safety and comfort, since the surplus peroxide gel and the mouth tray itself may cause irritation or damage to the gums or oral cavity.

In order to solve these problems, Japanese Patent No. 10,017,448, assigned to Lion Corp. discloses a sheet-shaped oral plaster, which comprises a teeth adhesive layer and supporting layer. A whitening agent used in the plaster includes kojic acid and derivatives thereof, ascorbic acid and derivatives thereof, carbamide peroxide and the like, among which kojic acid and various salts thereof are described as being effective. However, the above-mentioned whitening agents have a strong acidity, which may cause irritation to oral cavity. Further, since these agents effect whitening at a high acidity, it is difficult to produce good whitening without irritation. When this two-layer patch structure contains a high reactivity material such as a whitening agent, its stability degrades at high temperature even though being stored with a release liner attached.

US Patent Nos. 5,879,691, 5,891,453 and 5,989,569, and WO 98/55044, assigned to Procter & Gamble, disclose a delivery system for a teeth whitener, comprising a thin, transparent and flexible polyethylene strip having a professional whitening gel thereon, wherein the professional whitening gel is pre-coated during the manufacturing process or applied to the strip or teeth directly before the attachment to the teeth. Since it does not use a mouth tray, the usage is facilitated and improved. Further, because the strip is thin and transparent, its use does not present an obstacle to the daily life. However, the delivery system disclosed therein is a wet type whitening layer constructed by using a teeth whitening substance along with a gelling agent, preferably carboxypolymethylene, obtained

from B. F. Goodrich Company under the trade name of Carbopol, water, pH adjusting agent and additive carrier materials and applying the resultant highly viscous gel onto a strip of flexible polyethylene strip. When attaching and wearing the system onto teeth, the teeth whitening gel containing high concentration peroxide may adhere to and remain on hands, tongue, gums and the like. That is, such wet type gel systems have room for improvement in terms of handling. Further, in the two-layer embodiment consisting of a teeth whitening substance and strip, the peroxide stability is not sufficiently assured and the whitening effect may be diminished when stored at a high temperature or for a long period of time.

US Patent Nos. 5,310,563 and 5,639,445, assigned to Colgate-Palmolive Company, disclose a dental formulation comprising an active component dispersed in a polysiloxane polymer composition, available under the trade name of Dow Corning 3179 Dilatant Compound by Dow Corning Corporation, which is attached to the teeth by pressing it against the teeth and gum, and is easily removed from the teeth. The two-layer embodiment has the active whitening component encapsulated in the polymer. Therefore, the stability of the active peroxide component can be improved to some degree. However, this product has a disadvantage in that the active ingredient cannot be easily released from the Dilatant Compound in a short period of time, and consequently, an extended contact time is required to obtain the desired teeth whitening effect.

Therefore, there is a need for a dry type teeth whitening patch, which has improved peroxide stability at high temperature and safety to the human tissue during its attachment to the teeth.

Disclosure of the Invention

Therefore, it is an object of the present invention to provide a dry type teeth whitening patch, which provides sufficient contact time between teeth whitening agent and stains on surfaces of teeth, thereby achieving a teeth whitening effect in a short period of time.

It is another object of the present invention to provide a dry type teeth whitening patch which is safe when a user removes the patch from the release liner with his hands and fingers to attach it to the surface of his teeth, and to provide a patch where, when the patch is hydrated by moisture on the surface of the teeth, a contact adhesive layer which does not contain the teeth whitening agent acquires strong adhesiveness and subsequently, an active material reservoir layer hydrates and begins to release the whitening agent.

It is a still another object of the present invention to provide a dry type teeth whitening patch which has a good peroxide stability at a high temperature, wherein the active material reservoir layer containing peroxide, which is a whitening agent having a high reactivity, is protected by a contact adhesive layer.

It is a further object of the present invention to provide a dry type teeth whitening patch which has excellent adhesive strength and peel-off property, and is comfortable during use and, thereby is convenient to use.

It is a still further object of the present invention to provide a dry type teeth whitening patch in which the peroxide-containing layer does not stick to hands or face during the process of its attachment to the teeth and the peroxide-containing layer is protected by other layers, thereby being safe to the human body.

The above and other objects are accomplished by a dry type teeth whitening patch of the present invention having multi-layer structure of three or more layers comprising a contact adhesive layer, an active material reservoir layer and a backing layer, in which the contact adhesive layer contains no teeth whitening agent, the contact adhesive layer comprises a hydrophilic glass polymer as a base polymer so that it may have substantial adhesive strength when hydrated by water upon attachment to the teeth while having little or no adhesiveness before attachment to the teeth and subsequently, the active material reservoir layer under the contact adhesive layer begins to be hydrated and releases peroxide contained therein as a teeth whitening agent, the active material reservoir layer contains a peroxide stabilizer along with the peroxide, and the active material reservoir layer is protected

by one or more of the contact adhesive layer and the backing layer, thereby providing good peroxide stability.

The present invention provides a novel dry type teeth whitening patch comprising peroxide as a teeth whitening agent. In particular, the present invention provides a dry type teeth whitening patch which has a multi-layer structure of three or more layers comprising a contact adhesive layer which is substantially devoid of teeth whitening agent and consists essentially of a hydrophilic glass polymer, an active material reservoir layer which contains a peroxide as a teeth whitening agent and a backing layer, wherein when the patch is hydrated in a moist oral cavity the contact adhesive layer acquires strong adhesive strength and the active material reservoir layer also begins to be dissolved, thereby releasing the teeth whitening agent.

The dry type patch according to the present invention is convenient to use and, as compared to a conventional wet type patch, it is characterized in that the active material does not stick to the user's skin when the patch touches the hands or face. Such advantage may be accomplished by a two-layer patch where it is manufactured as a dry type patch. However, in the patch having a multi-layer structure of three or more layers according to the present invention, peroxide does not contact the user's skin during the process of its attachment to the teeth, because the active material reservoir layer containing peroxide is protected by one or more layers. Further, the dry type patch according to the present invention has excellent adhesive strength after being hydrated, so that, there is no difficulty in laughing and talking, and attachment to the teeth can be maintained for an extended period of time to assure enough contact time between the teeth whitening agent in the patch and stains on the teeth, thereby promoting rapid teeth whitening effect.

The conventional patches for teeth whitening comprising peroxide usually have a two-layer structure of an adhesive layer and a backing layer. The adhesive layer includes a teeth whitening agent and adhesive material. However, highly adhesive polymers generally used in the adhesive layer are poorly compatible with

peroxide. Such problems could be solved to some degree by constructing the patch as a dry type instead of wet type patch and using a polymer compatible with peroxide or a peroxide stabilizer. However, there still remains a demand for improving the peroxide stability at a high temperature. The present inventors
5 provide a novel dry type patch consisting of multi-layer structure of three or more layers.

According to the present invention, there is provided a dry type teeth whitening patch consisting of multi-layer structure of three or more layers comprising a contact adhesive layer, an active material reservoir layer and a backing
10 layer. The contact adhesive layer contains no teeth whitening agent and comprises a hydrophilic glass polymer. The active material reservoir layer comprises peroxide as a teeth whitening agent and polymers having a good compatibility with peroxide. Alternatively, the active material reservoir layer comprises a polymer which has low compatibility with peroxide but enables peroxide to be stable at a
15 high temperature when used with a peroxide stabilizer. Further, the backing layer is preferably impermeable to water in a manner similar to conventional two-layer patches. In the teeth whitening patch according to the present invention having multi-layer structure of three or more layers, the active material reservoir layer containing peroxide can be protected and the peroxide stability is improved.
20 Further, even when a release liner is not provided, the active material reservoir layer containing peroxide is not exposed to the air, thereby being safe and stable.

The dry type teeth whitening patch according to the present invention may further comprise a peroxide activator in the contact adhesive layer, along with a protective layer between the contact adhesive layer and the active material reservoir
25 layer containing peroxide. In this embodiment, peroxide does not directly contact the peroxide activator in the formulation. It is only when the patch is in use in the oral cavity that the peroxide activator promotes the whitening effect of peroxide to accomplish whitening effect in a short time period.

According to the present invention, there is also provided an embodiment wherein the contact adhesive layer contains no peroxide activator, a second layer contains a peroxide activator optionally along with other whitening agents such as papain or pyrophosphate, a third layer serves as protective layer, and a fourth becomes an active material reservoir layer containing peroxide.

In general, patches used for medical purpose are divided into two categories: a wet type and a dry type. The wet type patch is, for example, a hydrogel formulation, or a formulation formed by applying a gel to a backing layer or immersing the backing layer in a solution. This type of patch is characterized in that the initial state of the formulation is wet since content of water or humectant in the formulation is high. Meanwhile, the dry type patch is characterized in that the initial state of the formulation is dry since it is prepared by dry process and the water or humectant content in the formulation is low. For delivering a moisturizer or other medicinal components to dry skin, the wet type patch is preferable due to its high content of water and flexibility. However, the wet type patch generally lacks adhesive strength.

The wet type patch is manufactured by applying a gel to the backing layer or immersing the backing layer in a solution. A considerable amount of the gel layer may easily stick to the user's skin even when it briefly touches the skin during attachment to the teeth. Therefore, the wet type patch is inconvenient to use and lacks safety. Moreover, a medicinal agent or a gel comprising a teeth whitening agent may sometimes pass through a supporting layer toward the opposite side thereof. Especially, when a high concentration of peroxide is coated with a gel containing a large amount of humectant, the peroxide may stick to undesired sites, such as hands, lips, gums, etc., causing irritation. Further, if the humectant remains on the tongue, the user may have unpleasant feeling.

Therefore, in order to solve the above-described problems involved in the wet type patches, the present inventors adopt a dry type patch with a novel formulation. The dry type patch according to the present invention has advantages

in that it has a sufficient adhesive strength in a moist oral cavity while preventing the teeth whitening agent from adhering to hands or other places such as gums and tongue in the oral cavity, thereby reducing any unpleasant feeling while being worn by the user.

5 In order to produce such a dry type patch, it is necessary to select a polymer, which is able to acquire adhesiveness or strengthen its adhesiveness when hydrated by a small quantity of water at a desired place while having little or no adhesiveness in a dry state. Also, the polymer should begin to release a teeth whitening agent upon hydration. The inventors have discovered that hydrophilic
10 glass polymers have such properties and thus accomplished the present invention by employing hydrophilic glass polymer as a base polymer in a contact adhesive layer.

 The active material reservoir layer may contain such hydrophilic polymer as used in the contact adhesive layer so that when hydrated by saliva it releases peroxide, after the contact adhesive layer is hydrated. Alternatively, the active
15 material reservoir layer may contain such materials that are soluble in water and have good adhesiveness to the teeth and good compatibility with peroxide. For instance, shellac releases an active material contained therein when it is dissolved in water.

 As the last layer, a backing layer contains water-insoluble and water-
20 impermeable polymer as a film former in order to prevent the patch from sticking to gums or tongue and from deforming or being detached from teeth by saliva.

 The teeth whitening effect may be controlled by adjusting the thickness of patch or by varying active ingredients. Since the patch according to the present invention is transparent, it is possible for user to observe oxygen bubbles generated
25 by peroxide upon bleaching teeth or removing stains while wearing the patch, and thereby to recognize visibly the whitening effect. Also, the patch strip is transparent and not conspicuous upon wearing, so that the user's daily life is not affected.

The matrix type patch of the present invention is intended to be attached not to skin or mucous membrane, but to enamel layer of teeth so as to supply a teeth whitening agent to a surface of teeth for a sufficient time to whiten the teeth. The principle for providing that the patch is attached to teeth and a whitening agent
5 contained in the matrix is released onto the surface of teeth is described below.

In the field of transdermal drug delivery systems with time lag, there has been suggested a transdermal formulation using moisture transpired from skin to release a drug when a predetermined time passes after its attachment. More particularly, a barrier impermeable to the drug is provided between drug reservoir
10 and skin adhesion surface in the transdermal formulation. When the formulation is attached to skin, the barrier is gradually hydrated by moisture transpired from skin, whereby its permeability to drug is increased. In this case, a hydrophilic glass polymer is used as the barrier material.

The present inventors used a hydrophilic glass polymer in a contact
15 adhesive layer of a matrix type patch so that the adhesive layer acquires adhesiveness or strengthens its adhesiveness when hydrated by moisture on the teeth while having little or no adhesive strength when stored or handled with hands to be attached to the teeth. Most of such glass polymers, when hydrated, provide sufficient adhesive strength to enable the patch to be fixed at the contact site of the
20 teeth surface. Thus, according to the present invention, no additional means for fixing the patch to the teeth is required to attain sufficient contact time between the whitening agent and teeth, such as a marginal adhesive strip to be folded onto the back side of teeth. Once the contact adhesive layer is hydrated to have adhesive strength, the active material reservoir layer is subsequently hydrated and begins to
25 release a teeth whitening agent.

The patch of the present invention does not generate significant irritation of gums or skin in the oral cavity even though it directly contacts with them since it contains a small amount of whitening agent. In addition, the patch of the present

invention is attachable to teeth only, so that whitening agent is not released onto gums.

Thus, the dry type patch according to the present invention provides the above features by comprising multi-layer structure of three or more layers, wherein
5 the contact adhesive layer contains a hydrophilic glass polymer, the active material reservoir layer contains peroxide and the baking layer is impermeable to water.

For these purposes, the polymers which can be used in the contact adhesive layer of the patch according to the present invention includes polyalkylvinyl ether-maleic acid copolymer (PVM/MA copolymer) such as Gantrez AN 119, AN 139 and
10 S-97, polyvinyl alcohol, polyacrylic acid, Poloxamer (poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) triblock copolymer) 407 (Pluronic), polyvinyl pyrrolidone-vinyl acetate copolymer (PVP/VA copolymer) such as Luviskol VA and Plasdone S PVP/VA, polyethylene oxide (Polyox), polyvinyl pyrrolidone (PVP, K-15~K-120), Polyquaternium-11 (Gafquat 755N),
15 Polyquaternium-39 (Merquat plus 3330), carboxypolymethylene (Carbopol), hydroxypropylmethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, gelatin and alginate salt such as sodium alginate. The above-described polymers can be used alone or in mixtures thereof. Solvents for these polymers include water, ethanol or mixtures thereof. Further, other organic solvents such as ethyl
20 acetate, methylene chloride, isopropyl alcohol, acetonitrile or mixtures thereof with varied ratios may be also used as a solvent.

The patch to be attached onto teeth should be flexible enough to be deformable so that it conforms to contours of teeth. Since some polymers have a poor flexibility, suitable plasticizers may be added. Polypropylene glycol,
25 glycerin, polyethylene glycol are generally used as the plasticizers.

For the active material reservoir layer containing peroxide, all the hydrophilic polymers which may be used in the contact adhesive layer are preferably used. In addition, shellac, a polymer used as enteric coating material, which is

soluble in water at pH 6 or higher and is compatible with peroxide, can be used in the active material reservoir layer.

The above-described hydrophilic polymers may be used in the contact adhesive layer or other layers which contain no peroxide, without affecting the stability of peroxide. Considering the peroxide stability at a high temperature in the patch formulation, however, a hydrophilic glass polymer which is compatible with peroxide is preferably used in the active material reservoir layer containing peroxide.

Hydrophilic glass polymers such as polyvinyl pyrrolidone (PVP, K-15~K-120), polyquaternium-11, polyquaternium-39, polyvinyl pyrrolidone-vinyl acetate copolymer (PVP/VA copolymer) have good compatibility with peroxide and are easily soluble in water, ethanol or mixtures thereof. They also have a good solubility in organic solvents. Accordingly, peroxide in the patch can be stabilized by using organic solvents alone or mixed with water, for example, by using the mixture of water and ethanol in the ratio of 9:1 to 0:10, without using a stabilizer therefor. Polyethylene oxide, which is not soluble in ethanol but easily soluble in water or other organic solvents, has good compatibility with peroxide.

Polyvinyl pyrrolidone (PVP) is the most preferred hydrophilic glass polymer to be used in the active material reservoir layer containing peroxide. It is believed that the good compatibility of polyvinyl pyrrolidone with peroxide results from the stabilization of peroxide by formation of complexes with polyvinyl pyrrolidone via hydrogen bonding. Among the available PVP, K-15~K-120 are used, and K-90 (PVP) is preferably used in the patch of the present invention. K-30 (PVP) is more preferable since higher gel content is desired in the efficiency upon producing by casting method. Preferably, the PVP has a relatively high molecular weight, preferably greater than about 500,000, more preferably greater than about 1,000,000. In a preferred embodiment, PVP having a molecular weight of 1,270,000 is used. Further, peroxides are found to be compatible with polymers having quaternary ammonium structure, such as polyquaternium.

According to the present invention, an organic solvent or mixtures of water and ethanol are used as solvent for adhesive materials. Glass polymers which are highly compatible with peroxide are typically so hydrophilic that they cannot be uniformly coated on the surface of release liner or other sheet. An organic solvent
5 or mixtures of water and ethanol can solve such problem so as to form a uniform sheet layer. When the above-mentioned polymers which are highly compatible with peroxide are used, sufficient peroxide stability is obtained without using a stabilizer in the active material reservoir layer.

The active material reservoir layer also has plasticizer for the same reason
10 as in the contact adhesive layer. Although a suitable plasticizer may vary according to the polymer used, polypropylene glycol, glycerin, polyethylene glycol are generally used.

When a polymer of low compatibility with peroxide is used in the active material reservoir layer, a stabilizer is preferably added to overcome the expected
15 problems. A peroxide stabilizer in the formulation is one or more selected from the group consisting of alkylaryl sulphonates, alkyl sulphonates, alkyl carboxylates, alkyldiphenyloxide disulphonates, a series of Span such as Span 20 (sorbitan monolaurate), Span 40 (sorbitan monopalmitate), Span 60 (sorbitan monostearate), Span 80 (sorbitan monooleate) and Span 85 (sorbitan trioleate), POE sorbitan fatty
20 acid esters (TWEEN), glycerin fatty acid esters, organic acid monoglycerides, sodium stearyl lactates and polysorbates (POE(20) sorbitan monolaurate, POE(20) sorbitan monostearate, POE(20) sorbitan monooleate, POE(20) sorbitan tristearate, POE(20) sorbitan trioleate).

The teeth whitening agent contained in the active material reservoir layer
25 may be selected from a group consisting of hydrogen peroxide, carbamide peroxide, calcium peroxide, sodium percarbonate, sodium perborate, tetrasodium pyrophosphate peroxidate and mixtures thereof.

Generally, in the two-layer patch having an adhesive layer containing peroxide as a whitening agent and a backing layer, the peroxide content decreases as

time passes when the patch is stored at a temperature of 40 °C. Accordingly, the whitening effect of the patch in vitro is also observed to be lower, compared to a new patch. For a gel type formulation, loss of peroxide over time is small even when excessive polymer is used as a film-forming agent and a peroxide stabilizer is not added. Even when the formulation has low peroxide, stability, the desired effect can be obtained by using a small amount of chelating agent, such as EDTA or sodium citrate, known as a common peroxide stabilizer.

In a teeth whitening patch wherein the solvent of the gel layer is evaporated to form a sheet-shaped patch, when a stabilizer is not used in the composition, the peroxide stability is diminished, compared to the gel type formulation. It is also observed that the addition of a chelating agent results in a decrease in the peroxide stability of the patch, compared to a patch without a chelating agent. Furthermore, even when using Dequest phosphonates, which are known for their superior peroxide stabilizing effect, suitable peroxide stabilization cannot be obtained.

As described above, the reason why the peroxide stability in the patch differs in accordance with formulation type such as gel, liquid or sheet may be explained in a variety of ways. According to U. S. Patent No. 4,320,102, peroxide is described as being readily decomposed through a reaction catalyzed by a minimal amount of metal contained in the composition. There have been reported data showing that the presence of 0.1 mg of iron, 0.2 mg of copper, 0.1 mg of magnesium or 0.02 mg of chromium per 1 g of peroxide will lead to decomposition of peroxide. A sheet-type patch formed by evaporation of the solvent in a solution-type or gel-type patch would include a high content of metal on the thin sheet of patch. Further, a sheet-type patch has a large surface area, which allows a high rate of reaction on the surface, and also lowers the stability of the peroxide.

The stabilizer used in the patch according to the present invention is mostly surfactant or emulsifier, which is considered to form micelle and produce a preferable effect on the peroxide stabilization of the product. In practice, it was found that when gel is applied thinly over a large surface area, the residual amount

of peroxide decreases over time, while a gel of the same composition, contained in a container, is stable at a relatively high temperature.

However, according to the present invention, it is possible to solve the problem associated with peroxide stability in the patch at a high temperature, by using a dry type patch having multi-layer structure of three or more layers in which the layer containing peroxide is protected by the other layers. In a dry type patch having a two-layer structure, the peroxide stability at a high temperature may be improved by using a glass polymer having good compatibility with peroxide in the adhesive layer and by using peroxide stabilizer, when compared to the wet type patch. However, the dry type patch having multi-layer structure of three or more layers according to the present invention can achieve even better peroxide stability.

Further, the dry type patch according to the present invention may include a polyphosphate as an additional whitening agent along with peroxide in order to enhance the whitening effect.

Polyphosphates which can be used in the present invention include one or more selected from a group consisting of tetrasodium pyrophosphate (TSPP), sodium acid pyrophosphate (SAPP), sodium hexametaphosphate (SHMP), sodium tripolyphosphate (STP), sodium potassium tripolyphosphate (SKTP), tetrapotassium pyrophosphate (TKPP), acidic sodium metapolyphosphate and acidic sodium polyphosphate. In general, it is known that polyphosphate may be used effectively as a tartar controller in toothpaste to inhibit the formation of tartar or to remove tartar. Polyphosphate is also known as a good chelating agent to enhance the teeth whitening effect to some extent since it can effectively remove stains formed on the surface of the teeth, especially those formed of metal such as iron, calcium, magnesium, etc. derived from foods or working circumstances. It has been found that polyphosphate used along with peroxide in the patch according to the present invention may inhibit tartar formation and remove tartar by lengthening the contact time between teeth and polyphosphate. In practice, it is observed that when

attaching the patch of the present invention to teeth, surface of teeth and gaps between teeth get cleaned.

Polymers which can be used in the backing layer of the patch according to the present invention include cellulose acetate phthalate, polyvinyl acetate, ethyl
5 cellulose, polymethyl methacrylate, methacryloylethyl betain/methacrylate copolymer, commercially available under the trade name of Yukaformer manufactured by Mitsubishi, methacrylic acid copolymer, such as Eudragit L 100, Eudragit L 125, Eudragit L 100-55, Eudragit L 30D-55, aminoalkylmethacrylate copolymers, such as Eudragit E 100, Eudragit E 125, Eudragit RL 100, Eudragit RL
10 30D) or mixtures thereof. In addition, a polymer used as enteric coating material, which is not dissolved at pH 6 to 8 in oral cavity may be used.

In addition to the casting process using solvents, sheets of the patch may be manufactured by an extrusion process using thermoplastic polymers. Considering the efficiency of manufacturing process, a thin and flexible sheet, which is insoluble
15 in water and impermeable to water, made of polyethylene (PE), ethylvinyl acetate (EVA), ethylvinyl alcohol, polyester or polyurethane is preferably used as the backing layer, since it is possible to omit the manufacturing process of the backing layer.

The backing layer may contain any plasticizer for the same reason in the
20 contact adhesive layer and the active material reservoir layer. In this case, including the plasticizers described above, such as propylene glycol, glycerin, polyethylene glycol. Many kinds of plasticizer can be used depending on the solvent used. For example, castor oil or hydrogenated castor oil may also be used.

Further, upon attaching the patch of the present invention to teeth, in order
25 to make the teeth visually white, any white pigment may be used in the backing layer. For example, titanium dioxide, talc, hydroxyapatite, zinc oxide, or mixtures thereof may be used as the white pigment. When these pigments are not compatible with peroxide used as whitening agent, surface-treated titanium dioxide

may be used. In addition, it is possible to employ pearl material or pigments of a variety of colors depending on individual tastes.

In the teeth whitening patch, which is directly attached onto teeth in oral cavity, taste or flavor is a very important factor. Further, unlike toothpaste, it is removed some time after attachment to teeth, which lowers the fresh feeling with the lapse of time. On the other hand, the patch has the advantage that a specific flavor or taste lasts a long time since it may be attached for thirty minutes or longer at one time, unlike toothpaste normally used for one to three minutes. According to the present invention, flavor may be added to one or more layers of the contact adhesive layer, the active material reservoir layer and the backing layer. Preferably, the flavor is added to the active material reservoir layer containing peroxide so as to mask the taste of peroxide-containing layer and give flavor to the patch. It is also preferable for the flavor to be added to the water insoluble backing layer for a sustained faint fragrance.

In accordance with the present invention, such substances as enzymes, particularly dextranase or glucose oxidase, which cannot be used in conventional toothpaste due to their instability over time, may be used alone or in a mixture. It is also possible to add papain, which is known to have teeth whitening effect. Further, when applying the present invention for the treatment of oral disease, triclosan, chlorhexidine, vitamin E or its derivatives, such as, vitamin E acetate as well as oxidants, chlorophyll or its derivatives which are effective in removing foul breath may be added with the flavor.

It is known that staining due to tetracycline or smoking, or intrinsic staining requires more time to be whitened, compared to the staining due to food. Unlike familiar toothpaste, it is uncomfortable to attach and remove a teeth whitening patch for a long period of time. Accordingly, it is desirable to obtain a whitening effect in as short time period as possible. In order to shorten the time required for teeth whitening, a peroxide activator may be used along with peroxide. Since the stabilization of reactive peroxide in the patch is not easy, it is not preferable that a

peroxide activator be added to the layer containing peroxide. However, the patch according to the present invention has a multi-layer structure of three or more layers so that the peroxide activator may be contained in other layers, such as the contact adhesive layer, rather than the active material reservoir layer containing peroxide.

5 Of course, the present invention is not restricted to the addition of peroxide activator only to the contact adhesive layer.

Any substance known to activate peroxide may be used as the peroxide activator of the present invention. Metals such as Fe, Fe salts such as ferric chloride, Cu, Cu salts, Ca, Ca salts such as calcium hydroxide and calcium acetate,

10 Mn, Mn salts, Pt, Pt salts, Pd, Pd salts, Ag, Ag salts, manganese gluconate, sodium bicarbonate, sodium hydroxide, activated charcoal and combinations thereof may be used as the peroxide activator.

In an embodiment of the patch formulation according to the present invention containing a peroxide activator in the contact adhesive layer, the contact

15 adhesive layer contains substantially no peroxide and comprises a hydrophilic glass polymer as the primary polymer, thereby having little or no adhesive strength when in a pouch during storage. When hydrated by water upon attachment to the teeth, the patch has substantial adhesive strength along with the release of the peroxide activator, then a barrier layer containing neither peroxide nor peroxide activator is

20 dissolved, and subsequently, an active material reservoir layer containing peroxide is dissolved to release peroxide, which meets with the peroxide activator to accelerate its whitening effect.

Preferred Embodiments

Preparation examples

Example 1-10, Comparative example 1-5

In accordance with the compositions described below, the respective patches of Examples 1-10 and Comparative Examples 1-5 are prepared. The layers are prepared using conventional extrusion or solvent casting processes. Each

solution as indicated below is prepared and coated onto a suitable carrier substrate or casting drum to prepare layers by solvent casting. The solution is dried to form a film or layer. Preferably, the backing layer is cast initially, and the active material reservoir layer and adhesive layer are subsequently cast thereon in sequence.

5 Abbreviations used below have the following meanings.

TKPP: tetrapotassium pyrophosphate

SAPP: sodium acid pyrophosphate

TSPP: tetrasodium pyrophosphate

10 Example 1

Solution for preparing contact adhesive layer

Polyvinyl alcohol	10%
Glycerin	3%
Water	to 100%

15 Solution for preparing active material reservoir layer containing peroxide

Polyvinyl pyrrolidone	22%
Hydrogen peroxide	5%
Glycerin	10%
Ethanol	30%
20 Water	to 100%

Solution for preparing backing layer

Polyvinyl acetate	5%
Glycerin	5%
25 Ethanol	to 100%

Example 2

Solution for preparing contact adhesive layer

Polyvinyl pyrrolidone	5%
Hydroxypropylmethyl cellulose	5%

Propylene glycol	5%
<i>l</i> -menthol (flavor)	1%
Ethanol	to 100%

Solution for preparing active material reservoir layer containing peroxide

5	Polyethylene oxide	6%
	Polyvinyl pyrrolidone	20%
	Sodium percarbonate	15%
	Propylene glycol	3%
	Ethanol	to 100%

10 Solution for preparing backing layer

Ethyl cellulose	16%
Castor oil	8%
Ethanol	to 100%

15 Example 3

Solution for preparing contact adhesive layer

Polyquaternium-39	10%
Water	to 100%

Solution for preparing active material reservoir layer containing peroxide

20	Polyethylene oxide	15%
	Carbamide peroxide	10%
	Methyl salicylate (flavor)	0.4%
	Ethanol	50%
	Water	to 100%

25 Backing layer

Polyethylene

Example 4

Solution for preparing contact adhesive layer

20

Hydroxypropyl cellulose 10%

Ethanol to 100%

Solution for preparing active material reservoir layer containing peroxide

Polyvinyl pyrrolidone-vinyl acetate copolymer 20%

5 Hydroxyethyl cellulose 20%

Hydrogen peroxide 3%

SAPP 3%

Alkyldiphenyloxide disulphonate 1%

Glycerin 5%

10 Water to 100%

Solution for preparing backing layer

Eudragit 15%

Propylene glycol 5%

Ethanol to 100%

15

Example 5Solution for preparing contact adhesive layer

Hydroxypropyl cellulose 10%

Polyvinyl pyrrolidone 5%

20 Ethanol to 100%

Solution for preparing active material reservoir layer containing peroxide

Polyalkylvinyl ether-maleic acid copolymer 12%

Polyvinyl alcohol 5%

Tetrasodium pyrophosphate peroxidate 6%

25 Sorbitan trioleate 2%

Glycerin 5%

NaOH appropriate

(pH up to 7)

Water to 100%

Solution for preparing backing layer

Polymethylmethacrylate	8%
Acetone	to 100%

5 Example 6Solution for preparing contact adhesive layer

Polyalkylvinyl ether-maleic acid copolymer	12%
Glycerin	3%
Sodium bicarbonate	5%
10 Water	to 100%

Solution for preparing barrier layer

Polyvinyl alcohol	10%
Water	to 100%

Solution for preparing active material reservoir layer containing peroxide

15 Polyvinyl pyrrolidone	15%
Hydrogen peroxide	1.5%
Glycerin	5%
Sorbitan fatty acid ester	3%
Water	to 100%

20 Solution for preparing backing layer

Ethyl cellulose	20%
Eudragit	5%
Castor oil	12%
Mint (flavor)	0.2%
25 Ethanol	to 100%

Example 7Solution for preparing contact adhesive layer

Polyalkylvinyl ether-maleic acid copolymer	12%
--	-----

	Glycerin	3%
	Sodium bicarbonate	10%
	Water	to 100%
	<u>Solution for preparing active material reservoir layer containing peroxide</u>	
5	Hydroxypropyl cellulose	10%
	Polyvinyl pyrrolidone	10%
	Hydrogen peroxide	8%
	SAPP	1%
	Glycerin	5%
10	Sorbitan monolaurate	1%
	Water	to 100%
	<u>Backing layer</u>	
	Polyethylene	
15	<u>Example 8</u>	
	<u>Solution for preparing contact adhesive layer</u>	
	Polyethylene oxide	10%
	Glycerin	5%
	Calcium acetate	0.1%
20	Water	to 100%
	<u>Solution for preparing barrier layer</u>	
	Polyvinyl pyrrolidone	35%
	Hydroxypropylmethyl cellulose	3%
	Ethanol	to 100%
25	<u>Solution for preparing active material reservoir layer containing peroxide</u>	
	Polyquaternium	10%
	Polyvinyl pyrrolidone	5%
	Calcium percarbonate	2%
	Glycerin	5%

Ethanol to 100%

Backing layer

Polyurethane

5 Example 9

Solution for preparing contact adhesive layer

Carboxypolymethylene 2%

Fe 0.1%

Water to 100%

10 Solution for preparing barrier layer

Hydroxypropylmethyl cellulose 5%

Lemon Mint (flavor) 0.3%

Ethanol to 100%

Solution for preparing active material reservoir layer containing peroxide

15 Polyethylene oxide 10%

Polyquaternium 10%

Hydrogen peroxide 5%

Propylene glycol 7%

Ethanol to 100%

20 Solution for preparing backing layer

Cellulose acetate phthalate 30%

Castor oil 6%

Mixture of acetone and ethanol
(acetone:ethanol=4:1) to 100%

25

Example 10

Solution for preparing contact adhesive layer

Hydroxyethyl cellulose 20%

Polyalkylvinyl ether-maleic acid copolymer 5%

	NaOH	appropriate (pH up to 8)
	Water	to 100%
	<u>Solution for preparing active material reservoir layer containing peroxide</u>	
5	Polyquaternium	10%
	Polyvinyl pyrrolidone-vinyl acetate copolymer	5%
	Sodium percarbonate	20%
	Glycerin	5%
	Ethanol	to 100%
10	<u>Solution for preparing active material reservoir layer</u>	
	Polyvinyl alcohol	35%
	Dextranase	0.1%
	Glucose oxidase	0.1%
	Water	to 100%
15	<u>Solution for preparing backing layer</u>	
	Ethyl cellulose	25%
	Titanium dioxide	2%
	Yukaformer	2%
	Ethanol	to 100%
20	Comparative Example 1	
	<u>Solution for preparing adhesive layer containing active material</u>	
	Polyvinyl alcohol	10%
	PEG-ascorbic acid	6%
25	Propylene glycol	3.1%
	Water	to 100
	<u>Solution for preparing backing layer</u>	
	Ethyl cellulose	10%
	Castor oil	4%

Ethanol to 100

Comparative Example 2

Solution for preparing adhesive layer containing active material

5	Polyalkylvinyl ether-maleic acid copolymer	20%
	Tetrasodium pyrophosphate peroxidate	6%
	Dequest	0.1%
	Water	to 100%

Solution for preparing backing layer

10	Polyvinyl acetate	5%
	Yukaformer	5%
	Glycerin	6%
	Ethanol	to 100%

15 Comparative Example 3

Solution for preparing adhesive layer containing active material

	Carboxypolymethylene	12%
	Hydrogen peroxide	5.3%
	Glycerin	80%
20	Water	to 100%

Backing layer

Polyethylene

Comparative Example 4

25 Solution for preparing adhesive layer containing active material

	Shellac	12%
	Tetrasodium pyrophosphate peroxidate	5%
	NaOH	appropriate (pH up to 7)

Water to 100%

Solution for preparing backing layer

Polymethylmethacrylate 8%

Acetone to 100%

5

Comparative Example 5

Solution for preparing adhesive layer containing active material

Polyalkylvinyl ether-maleic acid copolymer 12%

Hydrogen peroxide 3%

10 EDTA 0.15%

NaOH appropriate
(pH up to 7)

Water to 100%

Solution for preparing backing layer

15 Ethyl cellulose 10%

Castor oil 6%

Ethanol to 100%

Test Examples

20

Test Example 1

The patches prepared as described above were measured for changes of surface condition after storing for one week at 40 °C. The results are shown in Table 1, in which O means the condition with increased stickiness and discoloration; and X means the condition without increased stickiness and discoloration. Further, the adhesiveness of the patches after being attached to the teeth was also determined. In Table 1, +1 means good; 0 means fair; and -1 means poor.

25

Table 1

	Increased Stickiness	Discoloration	Adhesiveness
Example 1	X	X	+1
Example 2	X	X	+1
Example 3	X	X	+1
Example 5	X	X	+1
Example 8	X	X	+1
Example 9	X	X	+1
Example 10	X	X	+1
Comparative Example 1	O	O	-1
Comparative Example 2	X	X	+1
Comparative Example 3	X	X	-1
Comparative Example 4	O	X	0
Comparative Example 5	X	X	+1

As seen in Table 1, the dry type patch having a multi-layer structure of three or more layers as in Examples 1, 2, 3, 5, 8, 9 and 10 or the dry type patch having double layers as in Comparative Examples 2 and 5, which contain the hydrophilic glass polymers in the adhesive layer, did not show increased stickiness and discoloration after being stored for one week at a temperature of 40 °C. On the other hand, the dry type patch of two-layer structure as in Comparative Example 1, which contains polyvinyl alcohol as a hydrophilic glass polymer in the adhesive layer and uses ascorbic acid or derivatives thereof such as PEG-ascorbic acid as a whitening agent, showed increased stickiness and severe discoloration with the lapse of time. Further, the dry type patch having a two-layer structure as in Comparative Example 4, which uses shellac which has good compatibility with peroxide in the active material reservoir layer containing peroxide, showed increased stickiness. The wet type patch of Comparative Example 3, in which the adhesive layer is a gel, showed poor adhesive strength such that it detached from the teeth when the user coughed or spoke loudly, even though showing a good condition after being stored.

Test Example 2

Teeth whitening effect of the patches prepared above were measured according to the following method.

5 (1) Preparation of contaminated hydroxyapatite (HAP) tablet specimen

Hydroxyapatite powder was formed into a tablet by means of IR press. The resulting tablet was sintered at a temperature of 1000 °C, molded by epoxy resin and etched using a strong acid. The tablet specimen was dipped in TSB (trypticase soybroth) solution having tea, coffee, iron and mucin dissolved therein and dried.
10 Such contamination was repeated several times over one week. After the contamination, the specimen was washed under running water with a mild brushing to remove loose contaminants. Finally, the specimen was dried at room temperature.

(2) Evaluation of teeth whitening effect

15 Initial luminosity values, L (100 indicates white and 0 indicates black) of the respective specimens were measured by means of chromoscope. The teeth whitening patches prepared in the above Preparation Examples were attached to the specimens which had been soaked in water. The specimens with the attached patches were stored in a thermohydrostat which had been set to condition similar to
20 those in an oral cavity, that is, at a temperature of 37 °C and a humidity of 95%. After a pre-determined time, the patches were detached from specimens. The detached specimens were washed with running water with a mild brushing and dried at room temperature. L value of each specimen was measured. Difference of L values before and after attaching the patches, ΔL was calculated for each patch.
25 The results are shown in Table 2.

Table 2

	ΔL (1 hour)	ΔL (3 hours)
Example 4	33.45 \pm 1.65	37.99 \pm 0.31
Example 5	28.99 \pm 0.04	36.84 \pm 1.15

Example 6	40.15± 2.31	42.00± 2.00
Comparative Example 1	7.05± 1.71	15.26± 2.37
Comparative Example 3	14.55± 2.41	30.35± 3.24
Comparative Example 5	14.73± 4.11	32.25± 3.33

As seen in Table 2, the patches of Examples 4 and 5 comprising peroxide along with polyphosphate as a whitening agent showed improved teeth whitening effect, when compared to those of Comparative Examples 1, 3 and 5 comprising peroxide alone. Further, the patch of Example 6 having four layers which contains a peroxide activator in the contact adhesive layer and peroxide in the active material reservoir layer showed prompt teeth whitening effect, compared to those containing no peroxide activator.

Test Example 3

Determination of residue on skin

The amount of residue on the skin after detaching the attached patches was determined by using a peel-off tester as follows: Each patch was weighed and attached onto the adhesion surface of a peel-off tester. After being detached mechanically, each patch was weighed and the amount of residue on the skin was calculated according to the following calculation: (the weight of patch before attachment - the weight of patch after peel-off)/(the weight of patch before attachment) X 100 (%). The results are shown in Table 3.

Table 3

	Amount of residue on skin
Example 3	0%
Example 5	0%
Example 6	0%
Example 7	0%
Comparative Example 1	0%
Comparative Example 3	84%

Comparative Example 5	0%
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As shown in Table 3, the dry type patches having a two-layer or multi-layer structure of three or more layers had little or no amount of residue on the skin. On the other hand, the wet type patch of Comparative Example 3, in which the adhesive layer is gel, showed extremely high amount of residue on skin even though using glass polymers were used.

Test Example 4

In the teeth whitening patches prepared according to the Preparation Examples, peroxide stability was evaluated after being stored in a pouch at the temperature of 40 °C.

Evaluation of peroxide content in patches

A solvent mixture which is capable of dissolving all layers of the patches was placed in an Erlenmeyer flask. An appropriate amount of the respective patches were weighed precisely, put into the flask and dissolved completely in the solvent mixture. 5 ml of 6 N HCl was added to the flask and about 2 g of potassium iodide was then dissolved in the solvent. The flask was kept for 1 hour in a cool and dark place. Then, the solution was titrated using 50 mM sodium thiosulphate and the peroxide content of the respective patches was quantified. The results are shown in Table 4.

Table 4 (40 °C, pouch)

Residual peroxide (%)	After 4 weeks	After 8 weeks	After 12 weeks
Example 4	82%	83%	79%
Example 7	89%	85%	80%
Comparative Example 2	80%	73%	50%
Comparative Example 3	82%	60%	41%
Comparative Example 5	78%	67%	55%

As shown in table 4, the dry type patches of Examples 4 or 7 using alkyldiphenyloxide disulphonate or sorbitan monolaurate as peroxide stabilizer

showed improved effect on the stabilization of peroxide in the teeth whitening patches, when compared to those of Comparative Examples 2 or 5 using Dequest or EDTA.

5 **Industrial Applicability**

As is apparent from the above description, the dry type patches for teeth whitening having multi-layer structure of three or more layers including a contact adhesive layer, an active material reservoir layer containing peroxide and a backing layer according to the present invention have superior teeth whitening effect. Further,
10 the patches are excellent in their adhesiveness and peel-off property, thereby being convenient to use. In addition, the peroxide-containing layer of the dry type patches according to the present invention does not stick to the hands or face during its attachment to the teeth. Furthermore, the peroxide-containing layer is covered and protected by other layers, which makes it safe to the human body. Especially,
15 the patches of the present invention show an excellent peroxide stability in the patch at a high temperature.

What is Claimed is:

1. A dry type patch for whitening teeth having a multi-layer structure of three or more layers comprising a contact adhesive layer, a backing layer, and an active material reservoir layer which comprises a peroxide, a peroxide stabilizer, and a hydrophilic glass polymer and is positioned between the contact adhesive layer and the backing layer;

wherein the contact adhesive layer is substantially free of a teeth whitening agent and comprises a hydrophilic glass polymer as a base polymer such that the contact adhesive layer provides substantial adhesive attachment to the teeth when hydrated by water and placed in contact with the teeth and has insubstantial adhesiveness before hydration and attachment to the teeth,

and the active material reservoir layer releases peroxide contained therein subsequent to the hydration and attachment of the contact adhesive layer to the teeth.

2. The patch for whitening teeth of claim 1, wherein the peroxide contained in the active material reservoir layer is selected from the group consisting of hydrogen peroxide, carbamide peroxide, calcium peroxide, sodium percarbonate, sodium perborate, tetrasodium pyrophosphate peroxidate and combinations thereof.

3. The patch for whitening teeth of claim 1, wherein the hydrophilic glass polymer is selected from the group consisting of polyalkylvinyl ether-maleic acid copolymer, polyvinyl alcohol, polyacrylic acid, Poloxamer (poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) triblock copolymer), polyvinyl pyrrolidone-vinyl acetate copolymer, polyethylene oxide, polyvinyl pyrrolidone, Polyquaternium-11, Polyquaternium-39, carboxypolymethylene, hydroxypropylmethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, gelatin, sodium alginate and combinations thereof.

4. The patch for whitening teeth of claim 1, wherein the peroxide stabilizer contained in the active material reservoir layer is selected from the group consisting of an alkylaryl sulphonate, an alkyl sulphonate, an alkyl carboxylate, an alkyl diphenyl oxide disulphonate, sorbitan monolaurate, sorbitan monopalmitate, sorbitan monostearate, sorbitan monooleate, sorbitan trioleate, a POE sorbitan fatty acid ester, a glycerin fatty acid ester, an organic acid monoglyceride, a sodium stearyl lactate, a polysorbate and combinations thereof.

5. The patch for whitening teeth of claim 1, wherein the patch further comprises a polyphosphate.

6. The patch for whitening teeth of claim 5, wherein the polyphosphate is selected from the group consisting of tetrasodium pyrophosphate, sodium acid pyrophosphate, sodium hexametaphosphate, sodium tripolyphosphate, sodium potassium tripolyphosphate, tetrapotassium pyrophosphate, acidic sodium metapolyphosphate, acidic sodium polyphosphate and combinations thereof.

7. The patch for whitening teeth of claim 1, wherein the backing layer comprises a water-insoluble polymer selected from the group consisting of cellulose acetate phthalate, polyvinyl acetate, ethyl cellulose, polymethylmethacrylate, a methacryloyl ethyl betain/methacrylate copolymer, a methacrylic acid copolymer, an aminoalkylmethacrylate copolymer and mixtures thereof.

8. A dry type patch for whitening teeth having a multi-layer structure of three or more layers comprising a contact adhesive layer, an active material reservoir layer and a backing layer;

wherein the contact adhesive layer is substantially free of a teeth whitening agent, and the active material reservoir layer comprises a peroxide and a hydrophilic glass polymer, as a base polymer, selected from the group consisting of polyvinyl

pyrrolidone-vinyl acetate copolymer, polyethylene oxide, polyvinyl pyrrolidone, Polyquaternium-11, Polyquaternium-39, and combinations thereof.

9. The patch for whitening teeth of claim 8, wherein the peroxide is selected
5 from the group consisting of hydrogen peroxide, carbamide peroxide, calcium peroxide, sodium percarbonate, sodium perborate tetrasodium pyrophosphate peroxidate and combinations thereof.

10. The patch for whitening teeth of claim 8, wherein the patch further
10 comprises a polyphosphate.

11. The patch for whitening teeth of claim 10, wherein the polyphosphate is
selected from the group consisting of tetrasodium pyrophosphate, sodium acid
pyrophosphate, sodium hexametaphosphate, sodium tripolyphosphate, sodium
15 potassium tripolyphosphate, tetrapotassium pyrophosphate, acidic sodium metapolyphosphate, acidic sodium polyphosphate, and combinations thereof.

12. The patch for whitening teeth of claim 8, wherein the backing layer
comprises cellulose acetate phthalate, polyvinyl acetate, ethyl cellulose,
20 polymethylmethacrylate, a methacryloyl ethyl betain/methacrylate copolymer, a methacrylic acid copolymer, an aminoalkylmethacrylate copolymer or mixtures thereof.

13. The patch for whitening teeth of claim 1 or 8, wherein the backing layer
25 contains one or more selected from the group consisting of polyethylene, ethylvinyl acetate, ethylvinyl alcohol, polyester and polyurethane.

14. The patch for whitening teeth of claim 1 or 8, wherein a peroxide
activator is contained in a layer which contains no peroxide.

15. The patch for whitening teeth of claim 14, wherein the peroxide activator is selected from the group consisting of Fe, a Fe salt, Cu, a Cu salt, Ca, a Ca salt, Mn, a Mn salt, Pt, a Pt salt, Pd, a Pd salt, Ag, a Ag salt, manganese gluconate, activated charcoal, sodium bicarbonate, sodium hydroxide and combinations thereof.

16. The patch for whitening teeth of claim 1 or 8, wherein the patch further comprises a protective layer between the contact adhesive layer containing a peroxide activator and the active material reservoir layer containing a peroxide.

17. The patch for whitening teeth of claim 1 or 8, wherein a flavor is added to one or more of the contact adhesive layer, the active material reservoir layer and the backing layer.

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER**IPC7 A61K 7/16**

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, MEDLINE, JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5401495 A (NATURAL WHITE INC.) 28 MARCH 1995, SEE THE WHOLE DOCUMENT	1 - 4
A	US 5122365 A (NATURAL WHITE INC.) 16 JUNE 1992, SEE THE WHOLE DOCUMENT	1 - 4
A	JP 10-17448 A (LION CORP.) 20 JANUARY 1998, SEE THE WHOLE DOCUMENT	1
A	JP 08-310929 A (EISAI CO LTD, BENTORETSUPU SANTE KK) 26 NOVEMBER 1996, SEE ABSTRACT AND CLAIMS	1
A	WO 99/34773 A (PROCTER & GAMBLE, MAJETI SATYANARAYANA) 15 JULY 1999, SEE THE WHOLE DOCUMENT	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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